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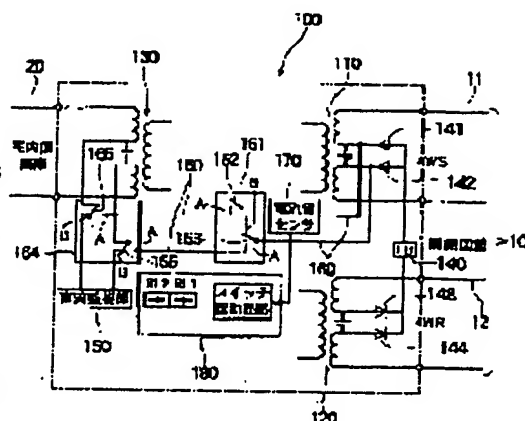
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## (54) IN-BAND RINGER

## (57)Abstract:

**PROBLEM TO BE SOLVED:** To provide an in-band ringer that can test entire lines from an exchange in a station leading to subscriber's terminals.

**SOLUTION:** A current sensor 170 of the in-band ringer detect the current of a signal sent to a 4WS 11 and gives the detected current to a control section 180. The control section 180 discriminates whether or not a signal sent to the 4WS 11 is a signal for measuring conductors and allows a built-in switch drive circuit 181 to close a relay switch 162 in a switch section 161 to throw a relay switch 163 to the position of a terminal A and to throw relay switches 165, 166 in a switch section 164 to the position of a terminal A, when the signal sent to the 4WS 11 is the signal for measuring the conductors. Through the switching above, a line 20 and the 4WS 11 are physically connected and the signal for measuring the conductors is sent to a line loop configured with the lines.



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## CLAIMS

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[Claim(s)]

[Claim 1] An inband lingua arranged on a circuit which connects inside of a house to an office, comprising:

A signal detection means which detects a signal for circuit tests from said office.

A signal-transmission means which connects a signal line by the side of an office, and an in-home signal line, and enables transmission of a signal for said circuit tests between said office and inside of said house, A control means which controls said signal-transmission means so that a signal line and said in-home signal line by the side of said office are connected only when a signal for first half circuit tests is detected by said signal detection means.

[Claim 2] The inband lingua according to claim 1 which a signal for said circuit tests is a direct current signal of a fixed current value, and is characterized by said signal-control means controlling said switch including a signal line which has a switch from which said signal-transmission means connects and cuts said office and a signal line between inside of said house.

[Claim 3] The inband lingua according to claim 1 or 2 when said control means carries out [ a signal for said circuit tests ] predetermined time continuation, wherein it connects said office and a signal line between in-home [ said ].

[Claim 4] The inband lingua according to claim 1 which a signal for said circuit tests is an AC signal of predetermined frequency, and is characterized by enabling an output of this signal with the same signal level as a signal into which said signal-transmission means is inputted.

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## DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the inband lingua which transmits tone ringer signals, such as a dial signal, using the signal of a voice frequency zone.

[0002]

[Description of the Prior Art] An inband lingua is a device which changes tone ringer signals, such as a calling signal, a receipt signal, and a dial signal, into the signal of a voice frequency zone (0.3-3.4 kHz), and is transmitted to a dedicated line. The inband lingua can connect the switchboard of an office, and the terminal unit in a house through three kinds of interfaces, OD (Office Data) interface, an extension interface, and a main wire interface.

[0003] By the way, when a circuit is constructed between the switchboard of an office, and the terminal unit in a house, in order to check the circuit state, various circuit tests are done. Line test equipment is used for such a circuit test.

Usually, it is installed in an office and conductor measurement for checking an open circuit of a circuit, etc. and level measurement for measuring the transmission loss of a circuit are performed.

[0004]

[Problem(s) to be Solved by the Invention] However, this circuit will break off physically by arranging an above-mentioned inband lingua on the circuit between a switchboard and a terminal unit. Therefore, even if it sent out the signal for line-test-equipment blank tests, a circuit state was not able to be checked about between an inband lingua and terminal units. For this reason, the inband lingua which enables the examination of the whole circuit from the switchboard of an office to the terminal unit in a house is demanded.

[0005] Therefore, the purpose of this invention solves the above-mentioned conventional problem, and there is in providing the inband lingua which enables the examination of the whole circuit from the switchboard of an office to the terminal unit in a house.

[0006]

[Means for Solving the Problem] In order to attain the above-mentioned purpose, an inband lingua of this invention comprises the following:

A signal detection means which is arranged on a circuit which connects inside of a house to an office, and detects a signal for circuit tests from said office.

A signal-transmission means which connects a signal line by the side of an office, and an in-home signal line, and enables transmission of a signal for said circuit tests between said office and inside of said house.

A control means which controls said signal-transmission means so that a signal line and said in-home signal line by the side of said office are connected only when a signal for first half circuit tests is detected by said signal detection means.

[0007] It is preferred that said signal-control means controls said switch especially including a signal line which has a switch from which said signal-transmission means connects and cuts said office and a signal line between inside of said house when a signal for said circuit tests is a direct current signal of a fixed current value.

[0008] As for said control means, when a signal for said circuit tests carries out predetermined time continuation, it is preferred to connect said office and a signal line between in-home [ said ].

[0009]When a signal for said circuit tests is an AC signal of predetermined frequency, it is preferred to enable an output of this signal with the same signal level as a signal into which said signal-transmission means is inputted.

[0010]

[Embodiment of the Invention]Hereafter, based on one illustrated embodiment, this invention is explained in detail. Drawing 1 is a figure showing the composition of one embodiment of the inband lingua concerning this invention which enables conductor measurement. The inband lingua 100 shown in the figure is connected between the office side circuit 10 (namely, the transmitting side circuit (4WS) 11 and the receiver circuit (4WR) 12) of a 4-wire system, and the in-home circuit 20 of a 2-wire system.

[0011]This inband lingua 100 enables conductor measurement of the whole circuit which results in the terminal unit which was connected to the in-home circuit 20 from the switchboard which was connected to the office side circuit 10, and which is not illustrated, and which is not illustrated. The signal for conductor measurement shall be transmitted to 4WS11 via a switchboard from the line test equipment which is a direct current signal which beyond predetermined time (for example, several ms) continues with a predetermined current value (for example, 1 mA), and was installed in the office and which is not illustrated.

[0012]The inband lingua 100 is constituted like the conventional inband lingua 100 including the two-wire circuit-4 line type circuit converters 110, 120, and 130, the loopback section 140, the diodes 141, 142, 143, and 144, and the direct-current Monitoring Department 150. The two-wire circuit-4 line type circuit converters 110, 120, and 130 change the office side circuit 10 of the 4-wire system to which transmission according to direction is performed, and the in-home circuit 20 of the 2-wire system with which transmission of a round trip is performed, and are constituted by the transformer and the capacitor, respectively.

[0013]The inband lingua 100 is constituted including the switch parts 161 and 164, the current value sensor 170, and the control section 180 which were provided on the signal line 160 and this signal line 160, in order to enable conductor measurement of the whole circuit from a switchboard to a terminal unit.

[0014]Transmission of a direct current signal of the signal line 160 is enabled between 4WS11 and the in-home circuit 20, and between these circuits is connected or cut by turning on and off of the switch parts 161 and 164. The current value sensor 170 is arranged on the signal line 160, detects the current value of the signal currently transmitted to 4WS11 from a switchboard, and sends out the detection value to the control section 180.

[0015]The control section 180 judges whether the signal currently transmitted to 4WS11 is a direct current signal for conductor measurement, or it is an audio signal based on the current value detected by the current value sensor 170, and controls the switch parts 161 and 164 according to the decision result. When the current value detected by the current value sensor 170 continues beyond in predetermined time and shows the predetermined value, the control section 180 specifically, Judge the signal to be a signal for conductor measurement, by the switch drive circuit 181 to build in, blockade the relay switch 162 in the switch part 161, and change the relay switch 163 to the terminal A side, and. The relay switches 165 and 166 in the switch part 164 are changed to the terminal A side.

[0016]Here, the signal for conductor measurement is a direct current signal which beyond predetermined time continues with a predetermined current value as above-mentioned. On the other hand, only while audio signals are few, they can exceed a predetermined current value. For this reason, when the current value detected by the current value sensor 170 continues a predetermined value beyond in predetermined time and the control section 180 is shown, That is, only when the signal currently transmitted to 4WS11 is a signal for conductor measurement, the switch parts 161 and 164 are controlled and the in-home circuit 20 is physically connected with 4WS11.

[0017]By such switching operation, the in-home circuit 20 will be physically connected with 4WS11, and the signal for conductor measurement will be transmitted to the line loop constituted by these circuits.

[0018]When the time after the in-home circuit 20 is physically connected with 4WS11 has passed beyond in predetermined time, the control section 180, By the switch drive circuit 181 to build in, open the relay switch 162 in the switch part 161 wide, and the relay switch 163 is changed to the terminal B side, and the relay switches 65 and 166 in the switch part 164 are changed to the

terminal B side. Since connection of in-home circuit 20 and 4WS11 is canceled and the signal for conductor measurement does not flow into the inband lingua 100 by such switching operation for a long time, it becomes possible to aim at preservation of the inband lingua 100.

[0019] Thus, when the signal for conductor measurement is transmitted to 4WS11 from the switchboard, the inband lingua 100 connects the in-home circuit 20 with 4WS11 physically, and constitutes a line loop by these circuits. That is, the signal for a conductor examination sent out from a switchboard is transmitted in 4WS11 and the in-home circuit 20, it reaches a terminal unit and the course which is turned up with this terminal unit, is transmitted in in-home circuit 20 and 4WS11, and returns to a switchboard is transmitted. Therefore, conductor measurement of the whole circuit from a switchboard to a terminal unit is attained.

[0020] When the signal for conductor measurement is transmitted to 4WR12, conductor measurement of the whole circuit from a switchboard to a terminal unit is attained by connecting the in-home circuit 20 with 4WR12 physically in a similar manner, and constituting a line loop.

[0021] By the way, although the case where conductor measurement of the whole circuit from a switchboard to a terminal unit was enabled was explained, an inband lingua can also consist of embodiments mentioned above so that level measurement of the whole circuit from a switchboard to a terminal unit may be made possible. Drawing 2 is a figure showing the composition of one embodiment of the inband lingua concerning this invention which makes level measurement possible. The inband lingua 200 shown in the figure is connected like the inband lingua 100 mentioned above between the office side circuit 10 (namely, the transmitting side circuit (4WS) 11, the receiver circuit (4WR) 12) of a 4-wire system, and the in-home circuit 20 of a 2-wire system.

[0022] This inband lingua 200 makes possible level measurement of the whole circuit which results in the terminal unit which was connected to the in-home circuit 20 from the switchboard which was connected to the office side circuit 10, and which is not illustrated, and which is not illustrated. The signal for level measurement shall be sent out via a switchboard from the line test equipment which is an AC signal of predetermined frequency (for example, 1020 kHz), and was installed in the office and which is not illustrated, and shall be transmitted to 4WS11.

[0023] The inband lingua 200 is constituted like the conventional inband lingua including the two-wire circuit-4 line type circuit converters 210, 220, and 230 and the high Brit transformer 240. The two-wire circuit-4 line type circuit converters 210, 220, and 230 and the high Brit transformer 240 change the office side circuit 10 of the 4-wire system to which transmission according to direction is performed, and the in-home circuit 20 of the 2-wire system with which transmission of a round trip is performed. The two-wire circuit-4 line type circuit converters 210, 220, and 230 are constituted by the transformer and the capacitor, respectively.

[0024] The inband lingua 200 is constituted including A/D converters 250 and 260, D/A converters 270 and 280, and the digital signal processor (DSP) 290, in order to make possible level measurement of the whole circuit from a switchboard to a terminal unit.

[0025] A/D converter 250 changes into a digital signal the analog signal of the exchange currently transmitted to 4WS11 from a switchboard, and sends it out to DSP290. On the other hand, D/A converter 270 is changed into the analog signal of exchange of the digital signal sent out from DSP290, and is sent out to the in-home circuit 20. A/D converter 260 changes into a digital signal the analog signal of the exchange currently transmitted to the in-home circuit 20, and sends it out to DSP290. On the other hand, D/A converter 280 is changed into the analog signal of exchange of the digital signal sent out from DSP290, and is sent out to 4WS11.

[0026] Drawing 3 is a block diagram showing the detailed composition of DSP290. As shown in the figure, DSP290 is constituted including the frequency detection part 291 and the amplifier 292 and 293. The frequency detection part 291 detects the frequency of the digital signal sent out from A/D converter 250. DSP290 sends out the digital signal inputted into the frequency detection part 291 to the amplifier 292, when the frequency value detected by the frequency detection part 291 shows the value of the signal for level measurement (i.e., when the signal currently transmitted to 4WS11 is a signal for a level examination).

[0027] A gain which compensates the conversion loss by A/D converter 250 and D/A converter 270 with the amplifier 292 is set up beforehand. This amplifier 292 amplifies the digital signal sent out from the frequency detection part 291. The amplified digital signal is changed into the analog signal of exchange by D/A converter 270, and is transmitted to the in-home circuit 20 by it.

[0028] And after the analog signal of the exchange transmitted to the in-home circuit 20 is turned up with the terminal unit in a house, is inputted into A/D converter 260 and changed into a digital

signal by this A/D converter 260, it is inputted into the amplifier 293. A gain which compensates the conversion loss by A/D converter 260 and D/A converter 280 with the amplifier 293 is set up beforehand. This amplifier 293 amplifies the digital signal inputted from A/D converter 260. The amplified digital signal is changed into the analog signal of exchange by D/A converter 280, and is transmitted to 4WS11 by it.

[0029]Thus, in the inband lingua 200, the signal for level measurement sent out from a switchboard is transmitted, reaches the terminal unit in a house, and folds this terminal unit into 4WS11 and the in-home circuit 20, and \*\*\*\*\* in-home circuit 20 and 4WS11 is transmitted, and it returns to a switchboard. Therefore, the level measurement of the whole circuit from a switchboard to a terminal unit becomes possible.

[0030]When the signal for level measurement is transmitted to 4WR12, Similarly, the signal for level measurement is made to transmit to 4WS11 and the in-home circuit 20, and the level measurement of the whole circuit from a switchboard to a terminal unit becomes possible by breaking by the terminal unit in a house and making a \*\*\*\*\* this signal transmit to in-home circuit 20 and 4WS11.

[0031]In the above, one embodiment of this invention was described over the drawing. However, this invention is not limited to the matter shown in said embodiment, but it is clear for the change, improvement, etc. to be possible based on the statement of a claim.

[0032]

[Effect of the Invention]Only when the signal for the circuit tests from an office is detected like the above according to this invention, the examination of the whole circuit which results in the terminal unit in a house is attained from the switchboard of an office by connecting the signal line by the side of an office, and an in-home signal line.

[0033]In particular, when the signal for the circuit tests from an office is a direct current signal of a fixed current value, conductor measurement of the whole circuit which results in the terminal unit in a house is attained from the switchboard of an office by connecting an office and the signal line between the inside of a house. When the signal for the circuit tests from an office is an AC signal of predetermined frequency, the level measurement of the whole circuit which results in the terminal unit in a house becomes possible from the switchboard of an office by enabling the output of this signal with the same signal level as the signal inputted.

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## DESCRIPTION OF DRAWINGS

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### [Brief Description of the Drawings]

[Drawing 1] It is a figure showing the composition of one embodiment of the inband lingua concerning this invention which enables conductor measurement.

[Drawing 2] It is a figure showing the composition of one embodiment of the inband lingua concerning this invention which makes level measurement possible.

[Drawing 3] It is a block diagram showing the detailed composition of DSP in drawing 2.

### [Description of Notations]

- 10 Office side circuit
- 11 4WS
- 12 4WR
- 20 In-home circuit
- 100 Inband lingua
- 110, 120, a 130 two-wire-circuit-4 line type circuit converter
- 140 Loopback section
- 141, 142, 143, and 144 Diode
- 150 Direct-current Monitoring Department
- 160 Signal line
- 161 Switch part
- 162 and 163 Relay switch
- 164 Switch part
- 165 and 166 Relay switch
- 170 Current value sensor
- 180 Control section
- 181 Switch drive circuit
- 200 Inband lingua
- 210, 220, a 230 two-wire-circuit-4 line type circuit converter
- 240 High Brit transformer
- 250, 260 A/D converters
- 270, 280 D/A converters
- 290 DSP
- 291 Frequency detection part
- 292 and 293 Amplifier

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Partial Translation of Reference 4

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**Column 4, Line 25 to Column 6, Line 13**

[0021] In the embodiment described above, description was made with respect to a case of enabling measuring of conductors in an entire circuit from an exchange to a terminal device. In addition to the above description, an in-band ringer can also be configured so as to enable measuring of levels of an entire circuit from an exchange to a terminal device. FIG. 2 is a view showing a configuration of an embodiment of the in-band ringer according to the present invention that enables measuring of levels. An in-band ringer 200 shown in FIG. 2 is connected between the station side circuit 10 (that is, the transmitter side circuit (4WS) 11 and the receiver side circuit (4WR) 12) of a four wire system and the subscriber side circuit 20 of a two wire system, as similar to the in-band ringer 100 described above.

[0022] The in-band ringer 200 enables measurement of levels of an entire circuit from an exchange (not shown) connected to the station side circuit 10 to a terminal device (not shown) connected to the subscriber circuit 20. A signal for measuring levels is an AC signal of a predetermined frequency (for example, 1020 KHz), which is sent out from a circuit test device (not shown) installed in the station through the exchange, and transmitted to the 4WS 11.

[0023] Similar to a conventional in-band ringer, the in-band ringer 200 includes two to four wire system circuit conversion sections 210, 220, and 230, and a hybrid transformer 240. The two to four wire system circuit conversion sections 210, 220, and 230, and the hybrid transformer 240 perform conversion between the subscriber side circuit 20 of a two wire system, in which go and return transmission is carried out, and the station side circuit 10 of a four line system, in which directional transmission is carried out. Each of the two to four wire system circuit conversion sections 210, 220, and 230 includes a transformer and a capacitor.

[0024] In addition, the in-band ringer 200 includes A/D converters 250 and 260, D/A converters 270 and 280, and a digital signal processor (DSP) 290, so as to enable measurement of levels of an entire circuit from an exchange to a terminal device.

[0025] The A/D converter 250 converts an analog signal of alternating current transmitted from the exchange to the 4WS 11 to a digital signal, and sends out the digital signal to the DSP 290. On the other hand, the D/A converter 270 converts the

digital signal sent out from the DSP 290 to an analog signal of alternating current, and sends out the analog signal to the subscriber side circuit 20. Also, the A/D converter 260 converts the analog signal of alternating current transmitted to the subscriber side circuit 20 to a digital signal, and sends out the digital signal to the DSP 290. On the other hand, the D/A converter 280 converts the digital signal sent out from the DSP 290 to an analog signal of alternating current, and sends out the analog signal to the 4WS 11.

[0026] FIG. 3 is a block diagram showing a detailed configuration of the DSP 290. As shown in FIG. 3, the DSP 290 includes a frequency detector 291, and amplifiers 292 and 293. The frequency detector 291 detects a frequency of a digital signal sent out from the A/D converter 250. When a frequency value detected by the frequency detector 291 indicates a value of a signal for measuring levels, that is, when a signal transmitted to the 4WS 11 is a signal for level testing, the DSP 290 sends out the digital signal input to the frequency detector 291 to the amplifier 292.

[0027] In the amplifier 292, a gain that compensates conversion loss generated in the A/D converters 250 and the D/A converters 270 is set in advance. The amplifier 292 amplifies the digital signal sent out from the frequency detector 291. The amplified digital signal is converted to an analog signal of alternating current by the D/A converter 270, and transmitted to the subscriber side circuit 20.

[0028] Then, the analog signal of alternating current transmitted to the subscriber side circuit 20 is returned by the terminal device in the subscriber and input to the A/D converter 260. The signal is converted to a digital signal by the A/D converter 260, and input to the amplifier 293. In the amplifier 293, a gain that compensates conversion loss generated in the A/D converters 260 and the D/A converters 280 is set in advance. The amplifier 293 amplifies the digital signal input from the A/D converter 260. The amplified digital signal is converted to an analog signal of alternating current by the D/A converter 280, and transmitted to the 4WS 11.

[0029] As described above, in the in-band ringer 200, a signal for measuring levels sent out from the exchange is transmitted through the 4WS 11 and the subscriber side circuit 20, and reaches the terminal device in the subscriber. Then, the signal is returned by the terminal device, transmitted through the subscriber side circuit 20 and the 4WS 11, and returned to the exchange. Accordingly, measurement of levels of the entire circuit from the exchange to the terminal device is enabled.

[0030] Similarly, when a signal for measuring levels is transmitted to the 4WR 12, the signal for measuring levels is transmitted to the 4WS 11 and the subscriber side circuit 20, and also the signal returned by the terminal device in the subscriber is transmitted to the subscriber side circuit 20 and the 4WS 11. In this manner, measurement of levels of the entire circuit from the exchange to the terminal device is enabled.

[0031] So far, the embodiment of the present invention has been described with reference to the accompanying drawings. However, the present invention is obviously not limited to the matters shown in the above embodiment, and modifications, improvements, and the like can be made on the basis of description of claims.

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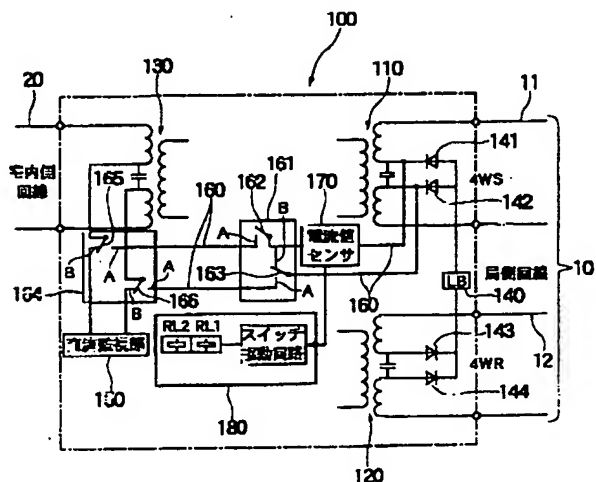
**最終頁に続く**

(54)【発明の名称】 インバンドリング

(57) 【要約】

【課題】局内の交換機から宅内の端末装置に至る回線全体の試験を可能とするインバンドリングを提供する。

【解決手段】電流値センサ１７０は、４ＷＳ１１に伝送される信号の電流値を検出しており、その検出値を制御部１８０に送出する。制御部１８０は、検出値に基づいて、４ＷＳ１１に伝送される信号が導体測定用の信号であるか否かを判断し、導体測定用の信号である場合には、内蔵するスイッチ駆動回路１８１によって、スイッチ部１６１内のリレースイッチ１６２を閉塞し、リレースイッチ１６３を端子Ａ側に切り替えると共に、スイッチ部１６４内のリレースイッチ１６５、１６６を端子Ａ側に切り替える。このような切替動作によって、回線２０と４ＷＳ１１が物理的に接続され、これらの回線によって構成される回線ループに導体測定用の信号が伝送される。



## 【特許請求の範囲】

【請求項1】 局と宅内を結ぶ回線上に配置されるインバンドリングにおいて、

前記局からの回線試験用の信号を検出する信号検出手段と、

局側の信号線路と宅内側の信号線路とを接続して、前記局と前記宅内間で前記回線試験用の信号を伝送可能にする信号伝送手段と、

前記信号検出手段によって前期回線試験用の信号が検出された場合にのみ、前記局側の信号線路と前記宅内側の信号線路が接続されるように前記信号伝送手段を制御する制御手段と、を備えることを特徴とするインバンドリング。

【請求項2】 前記回線試験用の信号が所定電流値の直流信号であり、

前記信号伝送手段が前記局と前記宅内間の信号線路を接続及び切断するスイッチを有する信号線路を含み、前記信号制御手段が前記スイッチを制御することを特徴とする請求項1に記載のインバンドリング。

【請求項3】 前記制御手段は、前記回線試験用の信号が所定時間継続した場合に、前記局と前記宅内側間の信号線路を接続させることを特徴とする請求項1又は2に記載のインバンドリング。

【請求項4】 前記回線試験用の信号が所定周波数の交流信号であり、

前記信号伝送手段が入力される信号と同一の信号レベルで該信号を出力可能とすることを特徴とする請求項1に記載のインバンドリング。

## 【発明の詳細な説明】

## 【0001】

【発明の属する技術分野】本発明は、音声周波数帯域の信号を利用して、ダイヤル信号等のトーンリング信号を伝送するインバンドリングに関する。

## 【0002】

【従来の技術】インバンドリングは、発呼信号、着呼信号及びダイヤル信号等のトーンリング信号を音声周波数帯域(0.3~3.4KHz)の信号に変換して専用回線に伝送する装置である。インバンドリングは、OD (Office Data) インタフェース、内線インタフェース及び局線インタフェースの3種類のインタフェースを通して、局内の交換機と宅内の端末装置を接続することができる。

【0003】ところで、局内の交換機と宅内の端末装置の間に回線を敷設した場合には、その回線状態を確認するために各種回線試験が行われる。回線試験装置は、このような回線試験に用いられるものであり、通常は局内に設置されて、回線の断線等を確認するための導体測定や、回線の伝送ロスを測定するためのレベル測定を行う。

## 【0004】

【発明が解決しようとする課題】しかしながら、上述のインバンドリングを交換機と端末装置の間の回線上に配置することにより、該回線が物理的に途切れてしまう。したがって、回線試験装置から試験用の信号を送出しても、インバンドリングと端末装置の間については回線状態を確認することができなかった。このため、局内の交換機から宅内の端末装置に至る回線全体の試験を可能とするインバンドリングが要求されている。

【0005】従って本発明の目的は、上記従来の問題点を解決し、局内の交換機から宅内の端末装置に至る回線全体の試験を可能とするインバンドリングを提供することにある。

## 【0006】

【課題を解決するための手段】上記目的を達成するため、本発明のインバンドリングは、局と宅内を結ぶ回線上に配置されるものであり、前記局からの回線試験用の信号を検出する信号検出手段と、局側の信号線路と宅内側の信号線路とを接続して、前記局と前記宅内間で前記回線試験用の信号を伝送可能にする信号伝送手段と、前記信号検出手段によって前期回線試験用の信号が検出された場合にのみ、前記局側の信号線路と前記宅内側の信号線路が接続されるように前記信号伝送手段を制御する制御手段とを備えて構成される。

【0007】特に、前記回線試験用の信号が所定電流値の直流信号である場合には、前記信号伝送手段が前記局と前記宅内間の信号線路を接続及び切断するスイッチを有する信号線路を含み、前記信号制御手段が前記スイッチを制御することが好ましい。

【0008】また、前記制御手段は、前記回線試験用の信号が所定時間継続した場合に、前記局と前記宅内側間の信号線路を接続させることが好ましい。

【0009】また、前記回線試験用の信号が所定周波数の交流信号である場合には、前記信号伝送手段が入力される信号と同一の信号レベルで該信号を出力可能とすることが好ましい。

## 【0010】

【発明の実施の形態】以下、図示した一実施形態に基いて本発明を詳細に説明する。図1は導体測定を可能とする本発明に係るインバンドリングの一実施形態の構成を示す図である。同図に示すインバンドリング100は、4線式の局側回線10(すなわち、送信側回線(4WS)11及び受信側回線(4WR)12)と2線式の宅内側回線20との間に接続されている。

【0011】このインバンドリング100は、局側回線10に接続された図示しない交換機から宅内側回線20に接続された図示しない端末装置に至る回線全体の導体測定を可能とするものである。なお、導体測定用の信号は、所定の電流値(例えば1mA)で所定時間(例えば数ms)以上継続する直流信号であって、局内に設置された図示しない回線試験装置から交換機を介して、4W

S11に伝送されるものとする。

【0012】インバンドリング100は、従来のインバンドリング100と同様に、2線式回線-4線式回線交換部110、120、130、ループバック部140、ダイオード141、142、143、144、直流監視部150を含んで構成されている。2線式回線-4線式回線交換部110、120、130は、方向別の伝送が行われる4線式の局側回線10と往復の伝送が行われる2線式の宅内側回線20の変換を行うものであり、それぞれ変圧器とコンデンサによって構成されている。

【0013】また、インバンドリング100は、交換機から端末装置に至る回線全体の導体測定を可能とするために、信号線路160、該信号線路160上に設けられたスイッチ部161、164、電流値センサ170、制御部180を含んで構成されている。

【0014】信号線路160は、4WS11と宅内側回線20間で直流信号を伝送可能とするもので、スイッチ部161、164のオンオフによって該回線間が接続又は切断されるようにする。電流値センサ170は、信号線路160上に配置され、交換機から4WS11に伝送されている信号の電流値を検出し、その検出値を制御部180に送出する。

【0015】制御部180は、電流値センサ170によって検出された電流値に基づいて、4WS11に伝送されている信号が導体測定用の直流信号であるか、音声信号であるかを判断し、その判断結果に応じてスイッチ部161、164を制御する。具体的には、制御部180は、電流値センサ170によって検出された電流値が所定値を所定時間以上継続して示している場合には、その信号を導体測定用の信号であると判断し、内蔵するスイッチ駆動回路181によって、スイッチ部161内のリレースイッチ162を閉塞し、リレースイッチ163を端子A側に切り替えると共に、スイッチ部164内のリレースイッチ165、166を端子A側に切り替える。

【0016】ここで、上述のとおり、導体測定用の信号は、所定の電流値で所定時間以上継続する直流信号である。これに対し、音声信号は、僅かな間だけ所定の電流値を超えることがあり得る。このため、制御部180は、電流値センサ170によって検出された電流値が所定値を所定時間以上継続して示している場合、すなわち、4WS11に伝送されている信号が導体測定用の信号である場合にのみ、スイッチ部161、164を制御して4WS11と宅内側回線20を物理的に接続するようにしたものである。

【0017】このような切替動作によって、4WS11と宅内側回線20が物理的に接続され、これらの回線によって構成される回線ループに導体測定用の信号が伝送されることになる。

【0018】また、制御部180は、4WS11と宅内側回線20が物理的に接続されてからの時間が所定時間

以上経過している場合には、内蔵するスイッチ駆動回路181によって、スイッチ部161内のリレースイッチ162を開放し、リレースイッチ163を端子B側に切り替えると共に、スイッチ部164内のリレースイッチ65、166を端子B側に切り替える。このような切替動作によって、宅内側回線20と4WS11の接続が解除され、インバンドリング100内に導体測定用の信号が長時間流れることがないため、インバンドリング100の保全を図ることが可能となる。

【0019】このように、インバンドリング100は、導体測定用の信号が交換機から4WS11に伝送されている場合には、4WS11と宅内側回線20を物理的に接続し、これらの回線によって回線ループを構成する。すなわち、交換機から送出される導体試験用の信号は、4WS11及び宅内側回線20を伝送されて端末装置に達し、この端末装置で折り返されて宅内側回線20及び4WS11を伝送されて交換機に戻る経路を伝送される。したがって、交換機から端末装置に至る回線全体の導体測定が可能となる。

【0020】なお、4WR12に導体測定用の信号が伝送される場合には、同様にして4WR12と宅内側回線20を物理的に接続して回線ループを構成することにより、交換機から端末装置に至る回線全体の導体測定が可能となる。

【0021】ところで、上述した実施形態では、交換機から端末装置に至る回線全体の導体測定を可能とする場合について説明したが、交換機から端末装置に至る回線全体のレベル測定を可能とするようにインバンドリングを構成することもできる。図2はレベル測定を可能とする本発明に係るインバンドリングの一実施形態の構成を示す図である。同図に示すインバンドリング200は、上述したインバンドリング100と同様に、4線式の局側回線10（すなわち、送信側回線（4WS）11、受信側回線（4WR）12）と2線式の宅内側回線20との間に接続されている。

【0022】このインバンドリング200は、局側回線10に接続された図示しない交換機から宅内側回線20に接続された図示しない端末装置に至る回線全体のレベル測定を可能とするものである。なお、レベル測定用の信号は、所定周波数（例えば1020KHz）の交流信号であって、局内に設置された図示しない回線試験装置から交換機を介して送出され、4WS11に伝送されるものとする。

【0023】インバンドリング200は、従来のインバンドリングと同様に、2線式回線-4線式回線交換部210、220、230、ハイブリットトランス240を含んで構成されている。2線式回線-4線式回線交換部210、220、230及びハイブリットトランス240は、方向別の伝送が行われる4線式の局側回線10と往復の伝送が行われる2線式の宅内側回線20の変換を

行うものである。2線式回線-4線式回線変換部210、220、230は、それぞれ変圧器とコンデンサによって構成されている。

【0024】また、インバンドリング200は、交換機から端末装置に至る回線全体のレベル測定を可能とするために、A/D変換器250、260、D/A変換器270、280、デジタルシグナルプロセッサ(DSP)290を含んで構成されている。

【0025】A/D変換器250は、交換機から4WS11に伝送されている交流のアナログ信号をデジタル信号に変換してDSP290に送出する。一方、D/A変換器270は、DSP290から送出されるデジタル信号を交流のアナログ信号に変換して宅内側回線20に送出する。また、A/D変換器260は、宅内側回線20に伝送されている交流のアナログ信号をデジタル信号に変換してDSP290に送出する。一方、D/A変換器280は、DSP290から送出されるデジタル信号を交流のアナログ信号に変換して4WS11に送出する。

【0026】図3はDSP290の詳細な構成を示すブロック図である。同図に示すようにDSP290は、周波数検出部291、アンプ292、293を含んで構成されている。周波数検出部291は、A/D変換器250から送出されるデジタル信号の周波数を検出する。DSP290は、周波数検出部291によって検出された周波数値がレベル測定用の信号の値を示す場合、すなわち、4WS11に伝送されている信号がレベル試験用の信号である場合には、周波数検出部291に入力されているデジタル信号をアンプ292に送出する。

【0027】アンプ292は、A/D変換器250及びD/A変換器270による変換ロスを補うようなゲインがあらかじめ設定されている。このアンプ292は、周波数検出部291から送出されるデジタル信号を増幅する。増幅されたデジタル信号は、D/A変換器270によって交流のアナログ信号に変換されて宅内側回線20に伝送される。

【0028】そして、宅内側回線20に伝送された交流のアナログ信号は、宅内の端末装置で折り返されてA/D変換器260に入力され、該A/D変換器260によってデジタル信号に変換された後、アンプ293に入力される。アンプ293は、A/D変換器260及びD/A変換器280による変換ロスを補うようなゲインがあらかじめ設定されている。このアンプ293は、A/D変換器260から入力されるデジタル信号を増幅する。増幅されたデジタル信号は、D/A変換器280によって交流のアナログ信号に変換されて4WS11に伝送される。

【0029】このように、インバンドリング200においては、交換機から送出されるレベル測定用の信号は、4WS11及び宅内側回線20を伝送されて宅内の端末装置に達し、この端末装置で折り返えされて宅内側回線

20及び4WS11を伝送され、交換機に戻る。したがって、交換機から端末装置に至る回線全体のレベル測定が可能となる。

【0030】なお、4WR12にレベル測定用の信号が伝送される場合には、同様に、レベル測定用の信号を4WS11及び宅内側回線20に伝送させると共に、宅内の端末装置で折り返えされた該信号を宅内側回線20及び4WS11に伝送させることにより、交換機から端末装置に至る回線全体のレベル測定が可能となる。

【0031】以上、本発明の一実施形態を図面に沿って説明した。しかしながら本発明は前記実施形態に示した事項に限定されず、特許請求の範囲の記載に基いてその変更、改良等が可能であることは明かである。

【0032】

【発明の効果】以上の如く本発明によれば、局からの回線試験用の信号が検出された場合にのみ、局側の信号線路と宅内側の信号線路が接続されることにより、局内の交換機から宅内の端末装置に至る回線全体の試験が可能となる。

【0033】特に、局からの回線試験用の信号が所定電流値の直流信号である場合には、局と宅内間の信号線路を接続することにより、局内の交換機から宅内の端末装置に至る回線全体の導体測定が可能となる。また、局からの回線試験用の信号が所定周波数の交流信号である場合には、入力される信号と同一の信号レベルで該信号を出力可能とすることにより、局内の交換機から宅内の端末装置に至る回線全体のレベル測定が可能となる。

【図面の簡単な説明】

【図1】導体測定を可能とする本発明に係るインバンドリングの一実施形態の構成を示す図である。

【図2】レベル測定を可能とする本発明に係るインバンドリングの一実施形態の構成を示す図である。

【図3】図2におけるDSPの詳細な構成を示すブロック図である。

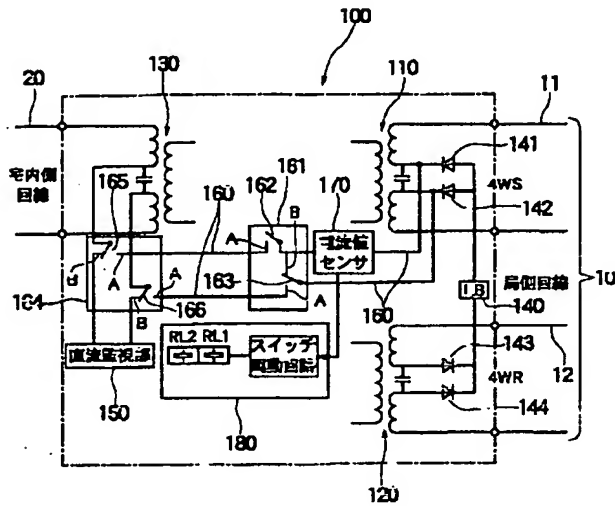
【符号の説明】

- 10 局側回線
- 11 4WS
- 12 4WR
- 20 宅内側回線
- 100 インバンドリング
- 110、120、130 2線式回線-4線式回線変換部
- 140 ループバック部
- 141、142、143、144 ダイオード
- 150 直流監視部
- 160 信号線路
- 161 スイッチ部
- 162、163 リレースイッチ
- 164 スイッチ部
- 165、166 リレースイッチ

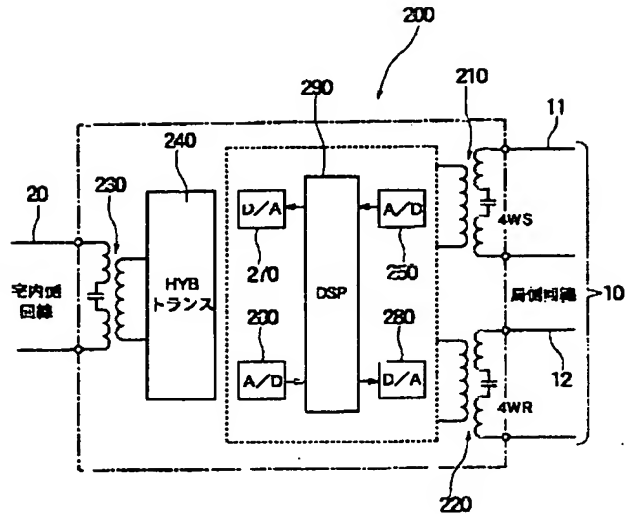
170 電流値センサ  
180 制御部  
181 スイッチ駆動回路  
200 インバンドリンガ  
210、220、230 2線式回線-4線式回線変換部

240 ハイブリットトランス  
250、260 A/D変換器  
270、280 D/A変換器  
290 DSP  
291 周波数検出部  
292、293 アンプ

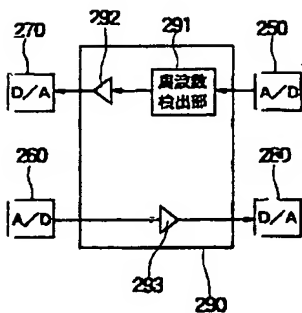
【図1】



【図2】



【図3】



フロントページの続き

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BA62 BB01 BB31 CA03 CB05  
CC02 CC10 CD01 CD08 CD10  
DA01 DB06 DC02 EA02  
5K027 AA00 BB04 EE15 EE16 FF02  
GG06 GG08 KK03 LL05 MM04  
5K037 AA07 AB07 AD01 BA01 BA03  
CA00 CB01 CB09  
5K051 AA09 BB01 CC01 DD07 DD12  
EE01 EE07 FF01 HH16 HH22  
HH25 JJ02 LL02